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Gas Journal

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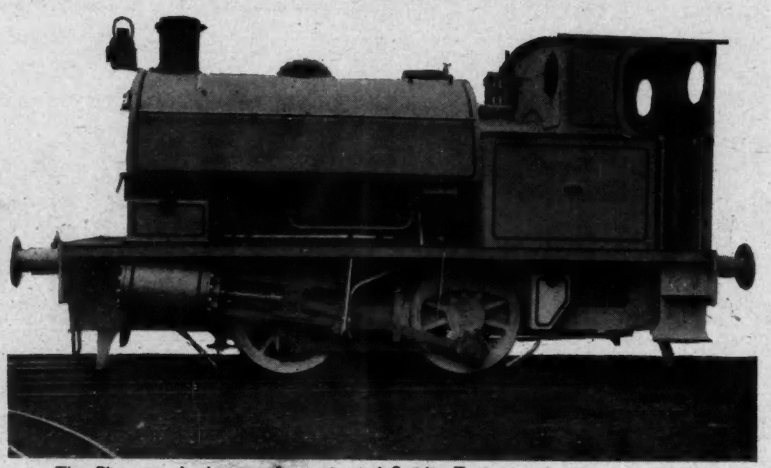

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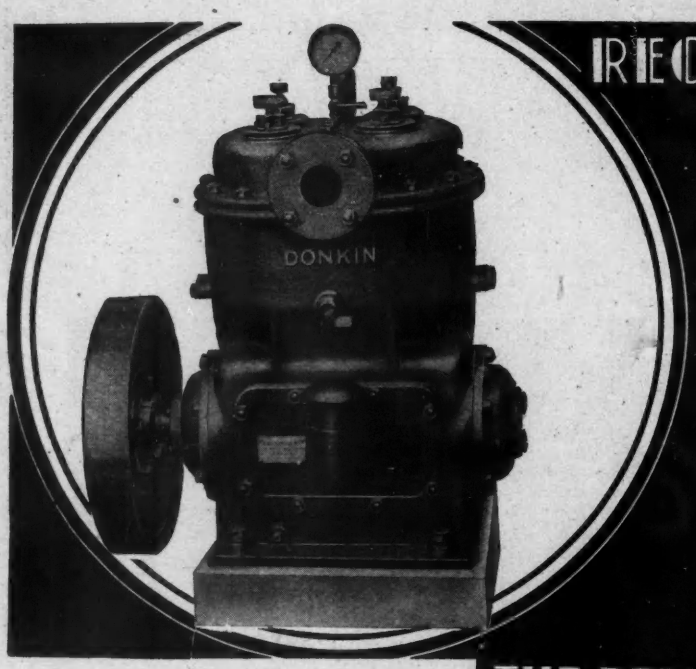

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CONTENTS

EDITORIAL NOTES

Fuel Usage Index 51
Survey and Observation 52

Personal 52
Obituary 53
Letter to the Editor 53

1843–1943 53
B.S. for Bolts and Nuts 54
Coal Tar Products Prices Order, 1942 . 54
Coal and Coke Supplies during January to March 54
Rubber Jointing Rings 54
Toys Out of Scrap 54

The Ironmonger Diary 54
Fuel Requirements of Carbonizing Plant. By S. Pexton, Ph.D. (*continued*) . 55

Gas Products Prices 64
Stocks and Shares 64

THIS WEEK'S ADVERTISERS

	PAGE
Aeraspray Manufacturing Co., Ltd.	47
Alder & Mackay, Ltd.	S2
Ascot Gas Water Heaters, Ltd.	Cover I
Bagnall, W. G., Ltd. ...	Cover II
Bale & Church, Ltd.	S3
Blakeley, Firth, Sons & Co., Ltd.	S3
Bratt Colbran, Ltd.	39
Bray, Geo., & Co., Ltd. ...	43
Broadbent, J. C., & Co., Ltd. ...	S3
Cowan, W. & B.	Cover III
Crane, Ltd.	S2
Curtis, A. L.	S2
Dempster, Robert, & Sons, Ltd.	S3
Derbyshire Silica Firebrick Co., Ltd.	40
Donkin Co., Ltd. (The Bryan)	Cover II
Ewart Chainbelt Co., Ltd. ...	S3
Fluxite, Ltd.	S4
Gas Meter Co., Ltd.	42
Gas Purification and Chemical Co., Ltd.	S3
Glenboig Union Fire Clay Co., Ltd.	45
Glover, Thos., & Co., Ltd. ...	50
Grant, David, & Co.	44
Green & Boulding, Ltd.	S4
Hamilton, Archd. H., & Co., Ltd.	47
Harrisons (London), Ltd.	S3
Holden & Brooke, Ltd.	40
Holmes, W. C., & Co., Ltd. ...	S5
Humphreys & Glasgow, Ltd. ...	48
Keith Blackman, Ltd.	S6
King's Patent Agency, Ltd. ...	S3
Johnson, C. H., & Sons, Ltd. ...	38
Londex, Ltd.	S2
Main, R. & A., Ltd.	60
Mewburn, Ellis & Co.	S3
Mitchell, H., & Co.	S2
Morton, Joseph, Ltd. ...	Cover IV
Oxley Engineering Co., Ltd. ...	35
Parkinson, W., & Co.	50
Peckett & Sons, Ltd.	S3
Power-Gas Corporation, Ltd. ...	41
Pulsometer Engineering Co., Ltd.	Cover IV
Quasi-Arc Co., Ltd....	41
Radiation, Ltd.	58, 59
Rawlplug Co., Ltd.	44
Reavell & Co., Ltd.	S3
Sawer & Purves, Ltd.	62
Slingsby, Walter, & Co., Ltd. ...	40
Stanton Ironworks, Ltd.	S4
Staveley Coal & Iron Co., Ltd. ...	46
Stein, John G., & Co., Ltd. ...	46
Stoves, Ltd.	49
Stringer, Bros.	47
Sutcliffe, Speakman & Co., Ltd. ...	38
Thomas & Bishop, Ltd.	64
Trotter, Haines & Corbett, Ltd. ...	S3
Turbine Furnace Co., Ltd. ...	40
Underpressure Engineering Co., Ltd.	S6
Walker, C. & W., Ltd.	62
West's Gas Improvement Co., Ltd.	S1
West's Piling & Construction Co., Ltd.	Cover IV
Westwood & Wrights, Ltd. ...	S3
Whessoe Foundry & Engineering Co., Ltd.	37
Winn & Coales, Ltd.	43
Withinshaw, A.	S3
Woodall-Duckham Co.	57
Trade Cards	64
Appointments Vacant	S4
Contract Open	S4
Patents	S3
Plant, &c.	S3
Plant, &c., For Sale and Wanted...	S4

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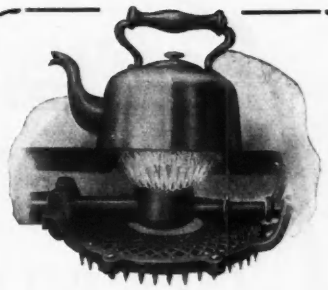

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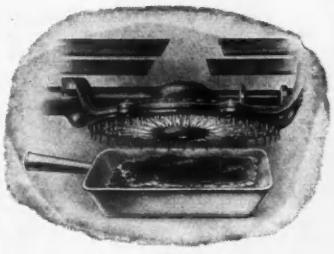

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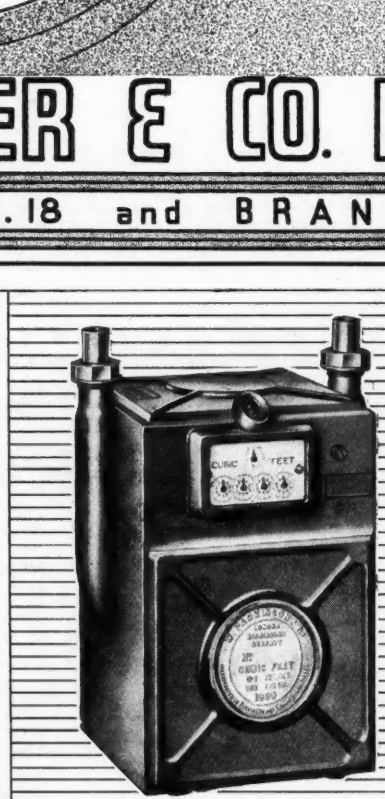

THE SOCIETY OF BRITISH GAS INDUSTRIES · 1905 ·

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p. 5

GAS JOURNAL, JAN. 13, 1943

VOL. 241 95th YEAR No. 4156

EDITORIAL NOTES

FUEL USAGE INDEX

IT is with radical and not heretical thoughts that we return to consideration of fuel usage on gas-works, and we would like it to be understood and accepted that as a background of what we have to say is our firm conviction that it is needful to have an atmosphere free from smoke, *and that it is essential to recover the products which coal can yield on carbonization.* Treatment of coal prior to its use domestically appears to us to be obviously desirable. It should be a tenet of any post-war plan.

January of 1943 witnesses movement and action, and shows considerable concentration on a factor in the carbonization and gasmaking process which to our mind is vital and fundamental; and naturally we wholly welcome the drive which is being made to ensure that gas manufacture is carried out in such a way that the therms contained in the raw materials used are converted into gaseous, liquid, and solid products with the minimum expenditure of fuel. We have no doubt, as we said last week, that the Gas Industry, if it is willing and prepared to look facts in the face, has it in its power to become unassailably *the* agency of fuel conservation to the benefit of the State and of the individual. All-important, however, is that clause concerning willingness to look facts in the face, so that in the future it may have no trepidation about the outcome of the deliberations of any impartial scientific tribunal which may and should be set up to examine the best ways of using the potential energy of coal. For any such impartial tribunal will, in the national interest, dismiss wishful thinking and fervid or frenzied propaganda on the part of any one section—gas, electricity, smokeless fuel, oil —of the several fuel interests involved. Or, at any rate, so we hope.

We suggest that the Gas Industry has quite a remarkable role to play post-war if it takes the opportunity now to think clearly on the question of coal conservation and national service. In which regard we would suggest also that in past years we may in all good faith have become somewhat bemused by reiteration of the efficiency of carbonization at the high figure around 80%, which sounds very well, but is, after all, *only a process figure*. It is pleasant to contemplate that from gas-works flue dust we can obtain liquid metal polish, that from ammoniacal liquor we can get stomonal, that from anthracene oil we can derive essence of orange blossoms, laxatives, purgatives, or even hypnotics. And it is easy enough to point a contemptuous or withering finger at the electricity industry with its one useful product from coal—electrical energy. Equally it is facile to say that in producing gas the Gas Industry also produces coke, and to forget that the coke is probably used at an efficiency little higher than that of the raw coal from which it was made. In commenting thus we would emphasize that coke is an up-graded product of coal, and would express our belief that the value of coke is bound to be increasingly appreciated in the future.

Following which dissertation it is with gratification that we turn to the activities of the Directorate of Gas Supply, which, in furtherance of the Industry's Fuel Economy Campaign, has been busy collating information from all gas undertakings and has arrived at a "fuel usage index" for the Industry. Briefly, this index is the relation of the potential energy in the raw materials used to the potential energy in the products for sale, and the national fuel usage index comes out at a figure of 26, calculated on the basis—

$$100 - \left(\frac{\text{potential energy in products for sale}}{\text{potential energy in raw materials used}} \times \frac{100}{1}\right).$$

The aim is to reduce this national figure. The fuel usage index of all gas undertakings concerning which the Gas and Electricity Division of the Ministry of Fuel has data has been calculated. The Directorate has sent to the various Regional Gas Engineering Advisory Boards the fuel usage indices of the different undertakings in their regions, and it is urged that all undertakings should be encouraged to examine the index not only of their undertakings as a whole but also the index of each separate works on which the data are available. We know that the figure for fuel usage index for different undertakings varies considerably from the national figure of 26, and it becomes increasingly obvious that we should consider gasmaking from the point of view of a gas-works as a whole as distinct from a carbonizing unit. Gas-production methods, producer operation, and steam raising must be critically examined. We think it should be possible for every gas undertaking to reduce its fuel usage index; and in this regard we point again to the significance, guidance, and help of Dr. Pexton's Paper, publication of which we continue in our pages to-day.

Let us abandon for the moment complacent contemplation of that 74% or so carbonization efficiency and concentrate on the fuel usage index. Approximately and in an elementary way we will put the matter thus: The national fuel usage index is 26. A ton of coal contains 300 potential therms. We use as fuel in gasmaking some 70 therms to produce 80 therms of gas. The efficiency of gas production is approximately 53%. If we use this gas at 50% efficiency the overall thermal conversion efficiency of coal to useful heat via gas is about 27%. And the moral is plain to see. The Gas Industry must reduce its national fuel usage index. We feel sure that this reduction can and will be made in the national interest and to the increased strength and usefulness of a vitally important Industry.

Again, let us look at this fuel usage index from another and more particularly an internal point of view. We hope that before very long it will be recognized in Gas Industry engineering circles that fuel *consumed* in a carbonizing plant during its normal life of say 2,000 working days is monetarily nearly twice as great as the capital cost of the carbonizing unit. In furtherance of which simple statement we could adduce many figures to emphasize the fundamental importance from the internal aspect of the Gas Industry's strength of concentrating on reduction of the fuel usage index. However, it seems unnecessary to confuse the main issue by detailed calculations.

To our mind there is nothing visionary about the matter. On

the contrary it is a thoroughly practical issue leading in the one direction of the better conservation of coal and, we repeat, leading towards the Gas Industry as the ideal agency for the purpose.

SURVEY AND OBSERVATION

SEVERAL people have expressed to us recently their perturbation at what appears to them to be a tendency in discussing post-war housing to talk a good deal about the virtues and bright future of electricity and to leave gas out of the picture. Questions to householders and others are being put in all sorts of surveys and by Mass-Observation asking them what they would wish for after the war, and electricity, it would seem, is a hot popular favourite, according to some of the indicated results. It is stated, for example, that Mass-Observation's latest survey in search of opinion from the working classes as to what they would regard as the ideal home brought out that electric cookers and electric points in most of the rooms would be appreciated. The report of the survey has not yet been issued, but the opinion we have mentioned has received some prominence in the Press. As a matter of fact we are not unduly depressed about this, though naturally we should like to see references to public enthusiasm about the place of gas in the post-war home.

The Liverpool Council of Social Service has published a bulletin giving the results of a survey undertaken by the Women's Organizations Committee in 1942 into what the people themselves want in the way of housing after the war. In this case gas is in the picture. The enquiry covered 386 flats and 448 houses—a total of 834—and among the questions asked were: Which do you prefer: gas, electricity, or coal fire for cooking, boiling clothes, heating rooms, heating water; and would you use smokeless fuel? In their answers, 386 were for gas for cooking and 313 for electricity; for clothes boiling, 446 for gas, 263 for electricity; for heating rooms, 67 for gas, 150 for electricity, and 561 for coal; for heating water, 77 for gas, 187 for electricity, and 489 for coal. Those who said they would use smokeless fuel numbered 174; 92 people were for the all-electric house and 647 were against it. Apparently no question was put to them about any preference for an all-gas home. Points to be noted about the survey are that in the thoughts of those interviewed gas wins over electricity only by a short head for cooking, but is largely favoured for clothes boiling, that there is a very great demand for the open fire, and that few people would be content with the all-electric home.

Such answers to questions are interesting, though we find it extremely difficult to know how to assess their value and what weight should be given to them. Obviously if an opinion is based without knowledge of electric or gas appliances of modern design, or is based on experience with modern electric equipment in comparison with obsolete gas appliances, or is based merely upon wishful thinking without any conception of how a supply of electricity or even gas is to be made available economically, it cannot be of great value. We think that a good deal of education is called for, and that, while the consumer should as far as possible and reasonable be allowed freedom of choice, the national welfare must have first place in post-war plans. At the present time, for example, Mass-Observation would no doubt speedily discover that the majority of people in this country would like bananas, but it would not be in the national interest to afford them supplies of this vegetable or fruit.

We do not think that we shall see, post war, an all-electric policy or an all-gas policy. As we have said before, the merits of gas will have to be better appreciated in responsible quarters and also in the homes of the people. We do need to educate the housewife to what gas can accomplish. The Gas Industry is strong enough to progress with other fuels in the field, but it must be wide awake to its possibilities, and must take note of surveys of the type to which we have referred here; it cannot afford to be complacent. Smokelessness is certainly desirable and should be planned for. It has been proved by experience that a combination of gas and coke is no more expensive than raw coal. It seems to us that what is wanted is a sense of perspective on the amount of heat required by the community, and the possibilities of gas and electricity meeting the demand in consonance with the consumer's ability to pay and with general economic stability. Smokeless fuel is bound, we think, eventually to replace raw coal. But, as we pointed out only recently, the coal consumer's cellar of to-day may, as far as potential heat content is concerned, be likened to a domestic gasholder. A coal consumer, in the normal way, stores coal against the periods of peak demand. Peak demands for heat are not meagre. Small householders store against the winter demand about 10,000,000 tons of coal. Translate this into terms of gas storage, bearing in mind that the total coal treated by the Gas Industry to-day is only 18,000,000 tons a year, and we arrive at something of a balanced picture—a picture which is sufficient to convince us, at any rate, that quickly to supplant raw coal either by gas or by electricity would be to cry for the moon.

Speaking a short while ago, the President of The Institution of Gas Engineers remarked that our present business gives a seasonal load factor of about 60%. Development of the domestic heating load by the Gas Industry might reduce this factor to 50%, but such a decrease is tolerable without undue increase in cost, because our capital requirements per therm are not high, and hour-to-hour variations in demand are smoothed out by storage. If we had to superimpose the hourly variations upon the seasonal variations it is doubtful whether we could achieve a load factor as high as 25%. "This," he went on, "is the problem with which the electrical industry would be faced if they attempted to take the whole domestic heating load by the so called all-electric house. Their problem is aggravated by the fact that the capital costs of electrical generating and distributing plant per useful therm supplied are double those we have to face. So that the electrical enthusiast who states that what can be done by gas can be done better by electricity is certainly not considering the problem from the viewpoint of the nation's economic welfare, or indeed from the point of view of cost to the consumer."

Economic factors, including coal conservation, must influence post-war policy. Production, distribution, and utilization of all fuels should be regarded as a single problem, the aim being to use each fuel in the sphere best fitted for it, with the interests of the public as a basic consideration.

Personal

Mr. W. LEES STENNING, Deputy-Chairman of the Haywards Heath District Gas Company, having, upon medical advice, retired from the Directorate, Mr. ALEC E. WHITCHER, Managing Director, has been elected Deputy-Chairman in his stead. He continues as Managing Director, but relinquishes the position of Engineer, General Manager, and Secretary, after 24 years' service.

Mr. S. H. COX, who has been Mr. Whitcher's Assistant Engineer since 1921, has been appointed Works Manager, and Mr. H. ORCHARD, the Chief Clerk, who has served the Company for nearly 40 years, has been appointed Acting Secretary.

The Haywards Heath District Gas Company is one of the Undertakings under the control of Associated Gas & Water Undertakings, Ltd., of which Mr. Whitcher is a Director.

* * *

Mr. ALEXANDER GEORGE GRANT, M.Sc., M.Inst.Chem.E., for the past four years General Manager of the Whessoe Foundry and Engineering Company, Ltd., Darlington, has now joined the Board of that Company. A graduate of Leeds University, Mr. Grant has been associated with the Company since 1930 and has taken a leading part in its recent technical developments.

* * *

Many friends who have made enquiries will be interested to know that Captain CLIFFORD A. KING is now recuperating at a convalescent hospital in Scotland. Since last May he was holding a staff appointment in the Faroe Islands, where he recently underwent an operation, successfully performed following a sudden illness.

Obituary

Mr. JOHN FISHER, who for many years represented John Wright & Co., Ltd., in Lancashire and the North, died at his home at Lytham St. Annes on Dec. 31. Mr. Fisher retired from active business in June, 1931.

* * *

The Directors of William Sugg and Company, Ltd., inform us of the death at Shaftesbury Military Hospital of Lt. A. M. (MONTY) SUGG, R. E., from an illness contracted in the course of his military duties. Lt. Sugg was in his 27th year and leaves a wife and infant daughter.

Appreciations of the late Stephen Lacey

By Sir DAVID MILNE-WATSON, Bart., LL.D., D.L.,
Governor of the Gas Light & Coke Company.

The sudden death of Stephen Lacey came as a great shock to his friends and colleagues, and indeed to the whole Gas Industry. At this time particularly it is a serious blow, not only to the Company in the service of which he had spent most of his life, but also to the Industry as a whole.

His work for the Gas Light & Coke Company is well known, and he filled with success important offices for many years.

For the last year he acted as Convener to the Post-War Planning Committee—a position of great importance. When it was decided to form a Committee to study post-war problems it was of the utmost importance to have a thoroughly capable Convener, not only from the technical point of view, but also a man of fine judgment and wisdom. It was unanimously agreed that Lacey possessed these qualifications, and that choice was amply justified.

He brought to his job a clear and orderly mind and also a grasp of essentials, which is rarely combined with a mastery of detail. His good judgment and ability to select the best from information and suggestions made him invaluable where proposals and ideas were of such scope and variety. The work he prepared for the Committee made it possible to concentrate on the questions that were vital. No doubt his training as an engineer was a great help in presenting his reports in such a clear and graphic manner.

Of his personal character it is impossible to write too highly. It was my good fortune to see more of him than anyone else during his long period of service with the Company. He was an absolutely loyal officer who put the Company before everything else. I never heard him say an unfair thing about anyone, and his understanding smile and courteous patience no doubt were the cause of his being the friend and confidant of the young as well as of his own generation. A very quiet and modest exterior, he had a great sense of humour, and he made one of the best of friends. He will be very hard to replace. We shall miss him for his work's sake and for his human personality.

By E. V. EVANS, O.B.E.,
President of The Institution of Gas Engineers.

The progress of an Industry is bound up with the efficiency of its leaders, and our Industry at a most difficult stage in its development has suffered an irreplaceable loss.

Stephen Lacey and I were boys together at the same school in the days when his father was Engineer at the Lupus Street Works of the Gas Light & Coke Company, and thus I am writing as an acquaintance of long standing.

He was President of The Institution of Gas Engineers in 1937, and had earned the respect and admiration not only of all members of our Industry, but also of a very large number of persons with whom we maintain contact. Appreciative though we have been of his services to the Industry, it is perhaps only now that we shall learn fully how ably he was performing the difficult task of Convener to the Post-War Planning Committee of the British Gas Federation.

My own admiration of Stephen Lacey is deep and sincere; as a technician he had become an outstanding authority on all matters concerning the supply and the use of gas ; as an administrator he possessed a clear and agreeable form of presentation of his subjects which allowed his views to be adopted willingly by those he was leading.

The Industry has suffered a great loss in the passing of Stephen Lacey, and the many of us who were attached to him by bonds of affection have lost a much respected friend.

By JAMES JAMIESON.

We have suffered a loss which has brought sadness to us all by the sudden and untimely death of Stephen Lacey. In the midst of the anxieties of these hard and heroic days we still do well to pause from other thoughts and tasks to do homage to the memory of our friend and colleague who was so notable a figure in our Industry. His great mental powers and his faculty of uttering his thought with the grace and charm of lucid and persuasive words have long been recognized and much respected.

No one was more individual, yet no one was so sure of his footing as one among the ordinary manhood of his time. For his high ability the depth and warmth of his friendship and the simple modesty of his character we shall treasure his memory.

I recall Stephen's words when he addressed the Scottish Junior Gas Associations in 1935: "The Gas Industry as a whole is in a transitional stage of reorganization and re-orientation of management outlook. That is a state of affairs that must lead to opportunities for young men with the right sort of training and mental equipment; and to those who are looking ahead and trying to fit themselves for the future I would say—'Take full advantage of the many facilities that exist for technical education, but don't allow the acquisition of technical knowledge to narrow your outlook and make you relatively insensitive to the commercial view of things.' "

As a member of the Post-War Planning Committee I cannot speak too highly of the enthusiasm and the energy which Stephen Lacey applied to the heavy and important task of Convener. I pay tribute to a great man, a colleague whose passing leaves the Industry the poorer.

In sorrow I say my farewell, remembering with sympathy and respect the still greater sorrow at his home.

Letter to the Editor

Mr. Therm Post-War

DEAR SIR,—One important fact which it appears to me is emerging out of our wartime work in the Industry is the post-war position of Mr. Therm. He has burnt to serve the war effort well and truly, and in doing this grand work he has shown the world how futile his job would be without Mr. Service being with him throughout. Should we not, therefore, in the peace to come, see that these two fine lads are joined up in a new symbol which will clearly portray the Spirit of Coal and all that goes with it.

In a recent technical advertisement Mr. Therm was elevated to the Hyphenage as Mr. Service-Therm, and no doubt many keen gas men are thinking about the future of the little man, notwithstanding all the calls upon their time. Why not get the B.C.G.A. to start a competition among gas consumers and the public generally, with War Savings Certificates for prizes, to produce a symbol which will do our Industry full justice in the difficult and competitive days to come ?

Yours faithfully,
"TOKEN."

1843–1943

A notable centenary takes place this year in that Alexander Wright & Co. were established in 1843 at Westminster, the original works being on what is now the site of Thames House. The well-known works address at Page Street, Westminster, was vacated when the area was scheduled under the rebuilding scheme, and the works were again removed to South London. The Westminster association is still retained, however, through the offices and showrooms at Westminster Palace Gardens.

Mr. Alexander Wright was an engineer of repute in many fields, and founded the business primarily as a gas engineer and instrument maker. Many gas appliances, instruments, and apparatus had their origin in those early days, the Wright's Register still being well known and used on several works. His successors (on incorporation of the firm in 1896) carried on the basic principles laid down, extended the field of activity, and pioneered the scientific control of gas-works processes, in photometry, calorimetry, gravitometry, pressure and vacuum recording and indicating; and—in other fields—fuel economy by the introduction of fuel calorimeters, CO_2 recorders, and draught gauges of many kinds. High technical skill, knowledge and manufacturing ability have brought the firm into contact with designers and others needing the manufacture of special instruments and apparatus, and under present conditions the firm has been called upon to apply and adapt its standard lines to such activities.

On the occasion of its centenary the firm has issued a wall calendar showing a splendid view of Westminster. We are asked to state that this form of memento is in lieu of a more elaborate plan which had been devised to mark the occasion; but subsequent official restrictions and regulations prevented the plan being carried into effect.

Correction.—We regret having incorrectly stated last week that a meeting of the B.C.G.A. Publicity Sub-Committee would be held at Gas Industry House at 11 a.m. on Jan. 23, with a full Executive Committee Meeting in the afternoon. The date of these meetings is Jan. 26.

A Joint Meeting of the Chemical Society, the Institute of Chemistry, the Society of Chemical Industry, and the Institute of Fuel, will be held at Bristol University on Jan. 21, at 5.30 p.m., when Dr. E. W. Smith, C.B.E., Director-General of Gas Supply, Ministry of Fuel and Power, will speak on "Fuel Economy and the Chemist."

B.S. for Bolts and Nuts

In 1941 the British Standards Institution issued at the request of the Iron and Steel Control of the Ministry of Supply a War Emergency British Standard for black bolts, B.S. 916, providing for bolts and nuts having smaller widths across flats and thicknesses than those in the regular Whitworth series covered by B.S. 28. The object of the introduction of this War Emergency Standard was to secure the utmost economy in steel consumption, and the corresponding specification for turned and cold forged bolts has recently been published by the British Standards Institution as B.S. 1083.

This specification has also been prepared at the request of the Ministry of Supply and supersedes B.S. 191 and 193. It covers both B.S.W. and B.S.F. bolts and nuts. The nominal dimensions of the widths across flats and the thicknesses of the bolts and nuts remain unaltered from the corresponding dimensions in B.S. 191 and 193, which are one size smaller than the regular Whitworth series, but amendments have been made in the tolerances to permit of the manufacture of the bolts and nuts either by turning from the bar or by cold forging. The specification also provides for one or two other minor relaxations in order to facilitate manufacture during the War Emergency.

As an appendix to the specification a schedule of physical properties is given for bolt and nut steels from 28 tons to 60 tons, and a system of marking the higher tensile bolts is now introduced.

A further appendix to the specification gives a code of part numbers which has been developed in conjunction with the Ministry of Supply for use in connexion with bolts and nuts for the Government Services, but which is equally applicable to the ordering and stocking of bolts and nuts in general engineering purposes.

Copies of this specification, B.S. 1083, may be obtained from the British Standards Institution, 28, Victoria Street, London, S.W. 1; price 2s. post free.

Coal Tar Products Prices Order, 1942

The Minister of Fuel and Power announces that, in pursuance of Regulation 55 of the Defence (General) Regulations, 1939, he has made the Coal Tar Products Prices Order, 1942.

The Order, which came into force on Jan. 1, is divided into six parts. Parts I–IV inclusive cover price control of anthracene, naphthalene, road tar, and coal tar acids respectively. Parts I–III are very similar to S.R. & O. 1942, Nos. 733, 736 and 659, which they supersede. Part IV, which replaces the Coal Tar Acids Prices (Inland) Order, S.R. & O. 1942, No. 731, has been extended to embrace coal tar acids sold or supplied for delivery to a buyer in the U.S.A. An Article has been incorporated enumerating the charges which may be added to the schedule prices in respect of coal tar acids sold for delivery in America. Minor changes have also been made in the schedules and in the methods of test.

Part V covers price control of creosote oil for hydrogenation purposes. Under this part of the Order, no person shall, except under permit, sell or supply any creosote oil for the purpose of hydrogenation, (1) other than at the fixed *ex* works price, (2) unless the oil conforms to the characteristics mentioned in the Order. The Order contains provisions enabling creosote oil not conforming to the characteristics mentioned in the Order to be sold for hydrogenation purposes under permit and at the price quoted in the permit.

Part VI of the Order contains general provisions.

All communications regarding the Coal Tar Products Prices Order should be addressed to the Coal Tar Control, Quebec House, Quebec Street, Leeds 1.

The Order is published as S.R.&O. 1942, No. 2509, and copies may be purchased from H.M. Stationery Office.

Additional duties in connexion with the development of fuels, other than petroleum, for road transport, have been allotted to Sir Alfred Faulkner, Director of Producer Gas Vehicles, and his designation has accordingly been changed to Director of Alternative Motor Fuels.

Coal and Coke Supplies during January to March

The Ministry of Fuel and Power announces that fuel restrictions for the three months January to March cover three groups of coal fuels.

(1) *Coal* (other than grades covered by (2) and (3) below: Supplies to any controlled premises during the three months may not exceed 15 cwt. in the Eastern, London, South-Eastern, Southern, and South-Western Regions, or one ton in the Northern, North Midland, Midland, North-Eastern, North-Western, Wales, and Scottish Regions, and no one may acquire any coal (except by licence from the Local Fuel Overseer) while he has more than 10 cwt. in stock.

(2) *Coke not exceeding* 1 *in. in size, anthracite, and Welsh dry steam coal not exceeding* 1¾ *in. and all types of manufactured fuel.*—Total supplies of fuel in this group may not exceed 10 cwt. per month, and no consumer may acquire any supplies while his stock of these fuels exceeds 10 cwt.

(3) *Coke exceeding* 1 *in. in size, and anthracite and Welsh dry steam coal exceeding* 1¾ *in.*—Total supplies of fuels in this group may not exceed one ton per month, and no consumer may acquire supplies while his stock of these fuels exceeds one ton.

The maximum figures specified are not rations. Priority will be given during these months of heavy consumption to the small consumers without stocking facilities, and the quantities available will depend on the supply position.

Rubber Jointing Rings

The British Standards Institution has recently issued revisions of the British Standards for rubber rings for joints in pipes. These revisions have been prepared in view of the urgent need for the conservation of rubber during the present period of emergency. Both Specifications deal with soft, medium, and hard rings.

Rings for gas mains are provided for in B.S. 772, which supersedes B.S. 772–1938. Copies may be obtained from the British Standards Institution, Publications Department, 28, Victoria Street, S.W. 1; price 2s. each (2s. 3d. post free).

Toys out of Scrap

Gasfitters of the City of Birmingham Gas Department recently embarked with enthusiasm on the making of toys in the waiting hours on A.R.P. Emergency Duty, with the object of giving seasonable presents to the children (about 160) of colleagues serving with the Forces.

Tinsmiths, storesmen, shorthand typists, showroom and clerical staffs all belonging to the Fittings Section became as keen as mustard, and in their own time took up hammer and nails, knitting pins, and needles to such good purpose that in a bare six weeks some 700 toys were made.

As a result it was possible to send in addition a gift of toys to five of the leading City hospitals.

The variety and quality of the toys were as remarkable as the numbers, particularly so when it is remembered that only scrap pieces of material were available. The ingenious mind was in evidence in a destroyer *ex* a worn-out broom, the fuselage of a bomber *ex* an old Indian club, the body of a railway engine *ex* a cocoa tin, and in many other devices. Here and there—*e.g.*, on railway engines, lorries, &c.—Mr. Therm appeared as a reminder of the origin of the toys.

The Lord Mayor (Councillor W. S. Lewis) and the Lady Mayoress inspected the complete collection at the Fittings Depot, Lord Street, and congratulated everyone concerned on the outstanding success of their efforts.

The Ironmonger Diary

In its 75th year the 1943 edition of the *Ironmonger Diary and Hardware Buyers' Guide* appears in the new "utility" page size. Of nearly 600 pages, 42 are devoted to notes on all the various wartime controls, regulations and legislation affecting the hardware trade, 26 to Trade Marks, 5 to details of trade and scientific associations and Control Departments, and 114 to a well-arranged buyer' guide. The diary section is just large enough for its purpose, and the advertisement pages reflect the stability of the trade and the spirit of optimism with which it enters upon the New Year.

The Rochdale Savings Committee have long wanted a local Centre for their activities, and were only deterred by the expense involved in such a project. This difficulty has been removed by the co-operation of the Gas Department and the Engineer and Manager, Mr. C. H. Bamber, and a Centre has been formally opened at the Gas Showrooms by Lord Kindersley, President of the national movement.

Colleagues at the Cambridge University and Town Gas Light Company have heard with gratification that A/c 1st Class Michael Nunn has been awarded the B.E.M. The official announcement describes his gallantry as follows: "On Aug. 19, 1942, Aircraftman 1st Class Nunn was wireless operator in a high-speed launch. During operations the launch was severely attacked by enemy aircraft. He remained at his post until his wireless equipment was shot away, and on going on deck found that he was the only member of the crew uninjured, the other members being either killed or wounded. He showed great presence of mind by first endeavouring to stop the engines until he was almost overcome by fumes. He then ran to the wheel and continued to steer the launch for the British coast until some time later he was taken aboard another launch. Shortly afterwards both launches were sunk by the enemy."

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

FUEL REQUIREMENTS OF CARBONIZING PLANT*

By

S. PEXTON, Ph.D.,

Gas Light and Coke Company

(*Continued from p.* 24)

Proportions of Heat Input to the Producers Available for the Carbonizing Plant

Let the total heat input to the producers be X. This should include the gross calorific value of the coke, its sensible heat, and the total heat of any steam from sources outside the producer system. If the steam admitted to the producers is generated within the producer gas system—*e.g.*, by annular boilers, or evaporation of water from grate bars—its heat content is already included in that of the coke entering the producers.

Let the heat content of the producer gas entering the retort setting be Y. This should include the net calorific value of the producer gas plus the sensible heat† of the producer gas if hot. The volume of producer gas is calculated from the weight of carbon gasified in the producers and the analysis of the producer gas.‡

Let Z be the *sensible* heat content of the waste gases leaving the retort setting. This item refers to the waste gases immediately prior to the exit from the recuperators or regenerators and includes the net calorific value of any unburnt producer gas. It does not include the sensible heat of the products of combustion of small leakages of coal gas into the combustion flues. The volume of waste gases is, therefore, calculated from their analysis and from the weight of carbon gasified in the producers.

Fig. 2 will probably be found helpful to an understanding of this discussion.

HEAT ACCOUNT FOR COKE OVENS.

Heat input to producers (X)	= 100
Heat lost in ashes, cooling of producer gas, surplus steam from annular boilers, latent heat of water of combustion of producer gas, &c. . . .	= 23.4
Heat supplied to oven battery (Y) . . .	= 76.6
Sensible heat of waste gases leaving regenerators (Z)	= 12.1
Sensible heat used and lost in oven battery (Y-Z) .	= 64.5

The overall heating efficiency is thus 64.5%.

The heat used and lost in the oven battery (*i.e.*, Y-Z) comprises items III to VI as enumerated at the beginning of this section of the Paper. Estimates of these items are as follows:

	Therms per ton of coal.
III. (*a*) Sensible heat of incandescent coke discharged from ovens	11.3
III. (*b*) Sensible and latent heat carried by crude coal gas leaving ovens	6.1
IV. Heat of production of water gas (ovens not steamed)	*nil*
V. Heat of decomposition of mixed Durham coals .	negligible.
VI. Radiation and convection losses from oven battery	3.1
Sensible heat used and lost in oven battery .	20.5

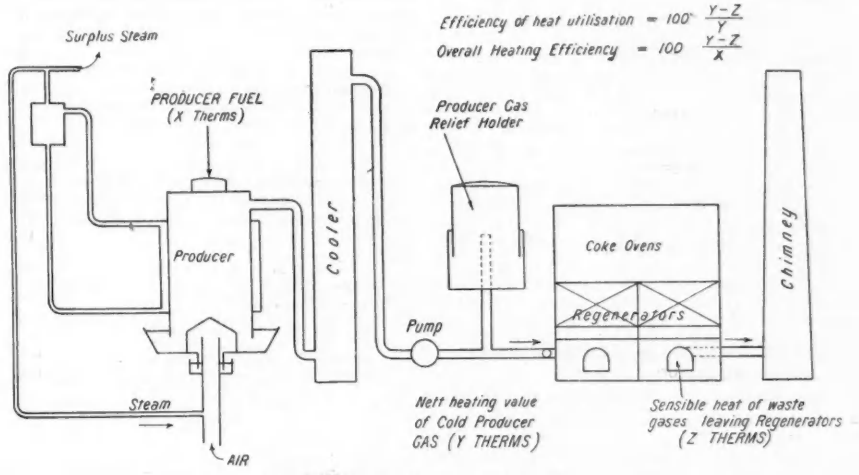

FIG. 2.—*Heating System of Coke Ovens.*

We thus have a heat input to the producers of X. Of this quantity the proportion $\frac{Y}{X}$ is usefully available for application to the retort setting. Z is the sensible heat lost to carbonization in the waste gases going forward to waste heat boilers, if present, or to the chimney.

The quantity of heat used in the retort setting (including radiation, &c., losses from the setting itself) is thus Y-Z. This quantity, expressed as a percentage of Y, may be termed the efficiency of heat utilization or expressed as a percentage of X may be termed the overall heating efficiency—*i.e.*,

$$\text{Efficiency of heat utilization (\%)} = 100\,\frac{(Y-Z)}{Y}$$

$$\text{and Overall heating efficiency (\%} = 100\,\frac{(Y-Z)}{X}$$

Let us for the moment anticipate some of the results which will be later discussed in greater detail, and, for example, let us consider the results from coke ovens.

This heat is applied with an overall efficiency, as defined above, of 64.5%.

The share of responsibility of each individual item towards the fuel charged to the producers is obtained as follows:

	Actual item as above (therms per ton of coal).		Fuel charged to producers (therms per ton of coal).
III. (*a*) Hot coke . . .	11.3	divided by	= 17.7
(*b*) Hot crude gas . .	6.1	0.645	= 9.5
VI. Radiation losses . .	3.1		= 4.8
Total	20.5		= 32.0

Each item is thus debited with its appropriate proportion of the producer and waste gas losses, a procedure recommended by L. Muir-Wilson (South Metropolitan Gas Company) in a paper to the Southern Association of Gas Engineers and Managers, March, 1939.

Having now summarized the significance of fuel consumption in relation to carbonizing plants and outlined the method of analysis of the problem, the remainder of the Paper is devoted to the detailed discussion of the various items in the fuel account and to experimental data from various carbonizing systems.

* Paper to the London and Southern District Junior Gas Association.

† Sensible heat contents of the common gases on a pound-molecular basis are given in Appendix I for the range of temperature normally experienced. These data are essential to a proper understanding of gaseous firing and frequent reference will be made to them throughout the Paper.

‡ For correlating gas volumes and weights the concept of pound-molecules is extremely useful. Appendix I contains a note which may be helpful to those not familiar with this American concept.

Other References to the Various Systems of Carbonization

The following list is by no means exhaustive, but indicates a few of the references which the Author has found particularly helpful.

Coke Ovens:

K. Baum—*Fuel in Science and Practice* (1930), **9**, 312–337.
J. Roberts and A. Jenkner—*International Coal Carbonization* (1934), published by Sir Isaac Pitman & Sons, Ltd., London.
H. C. Porter—*Coal Carbonization* (1924), published by Chemical Catalog Co., New York.
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J. J. Morgan—*American Gas Practice* (1931), published by J. J. Morgan, Maplewood, New Jersey, U.S.A.

Continuous Vertical Retorts:

H. W. Woodall—*Trans. I.G.E.* (1908), 97.
Carbonizing Committee Report—*Trans. I.G.E.* (1909), 131–143.
J. P. Leather—*Trans. I.G.E.* (1911), 122–128.
J. G. Newbigging—*Trans. I.G.E.* (1911), 129–148.
T. Brooke—*Modern Retort Settings*, published by John Allan & Co., London (1912).
A. Parker—*Trans. I.G.E.* (1919–20), 260–364.
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E. W. Smith—"Gas Journal" (1928), **184**, 845–848.
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M. Barash and T. A. Tomlinson—"Gas Journal" (1932), **197**, 32–36 and 90–94.
J. E. Blundell—*Trans. I.G.E.* (1931–32), **81**, 603–644.
F. B. Richards—"Gas Journal" (1934), **208**, 339–349.
F. B. Richards—*Trans. I.G.E.* (1937–38), **87**, 841–918.

Intermittent Vertical Retorts:

C. M. Croft—"Gas Journal" (1929), **187**, 251–256.
F. J. Dent—*Trans. I.G.E.* (1932–33), **82**, 638–727.
L. Litinsky—*Kokerei und Gaswerksofen* (1928). Kohle: Koks: Teer series of text-books edited by J. Gwosdz and published by W. Knapp.

Horizontal Retorts:

C. C. Carpenter—*Trans. Inc. Inst. Gas Eng.* (1893), **3**, 191–193.
G. M. Gill—*Trans. I.G.E.* (1920–21), 471–526.
E. V. Evans—*Cantor Lectures, Royal Society of Arts* (1924); "Gas Journal" (1924), **165**, 483–488, 550–559, and 629–634.
W. M. Carr—*Trans. I.G.E.* (1924–25), 210–253.

The application of *waste heat recovery* to continuous vertical retorts was specially dealt with by—

J. S. Thorman—"Gas Journal" (1923), **164**, 577–581.
A. Parker—*Trans. I.G.E.* (1923–24), 109–168.

Detailed Discussion of Various Items of the Fuel Account

I. *The Heat Losses entailed in Making Producer Gas.*

Most British carbonizing plants employ hand clinkered gas producers of brick construction and with step grates. The producers attached to settings of horizontal retorts are normally fed with hot

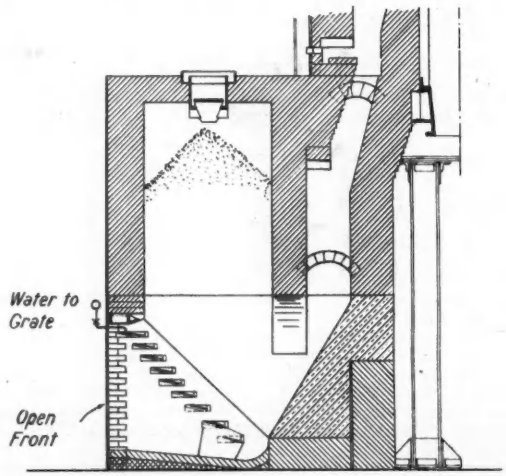

FIG. 3.—*Open-Fronted Step-Grate Producer (with Water on Bars) Supplying Hot Producer Gas direct to Setting of Vertical Retorts.*

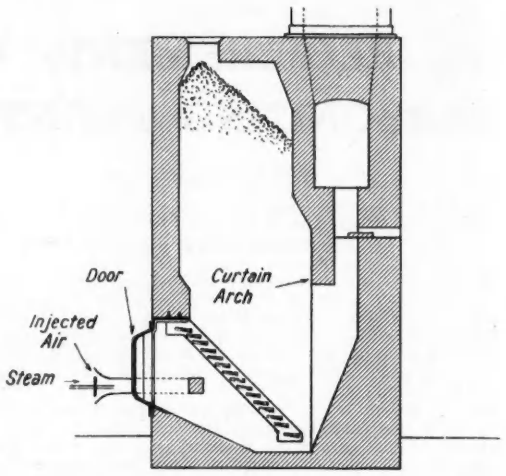

FIG. 4.—*Step-Grate Producer with Front closed by Clinkering Doors. Air Injected under Grate by Steam Injector. Hot Producer Gas supplied direct to Setting of Vertical Retorts.*

coke, direct from the retorts. The producers attached to settings of vertical retorts receive cold coke. In both cases the producer gas passes to the settings hot, without any special de-dusting. With most brick producers the air is drawn through the grate by chimney or fan draught, and the appropriate steam for moderating the temperature in the fire is generated from water fed to the grate bars. Some operators, however, prefer to supply air to the producers under slight pressure, using ejectors fed with steam, which also serves to saturate the primary air. Figs. 3 and 4 illustrate these types of producers.

When coke ovens are fired with producer gas the fuel gas is generated in external producers provided with rotary grates for ash removal. The producer gas is also cooled and cleaned. A Koppers rotary grate producer is illustrated in fig. 5.

The detailed results of tests upon step-grate producers attached to an installation of continuous vertical retorts and upon mechanically operated producers feeding cold clean gas to a battery of coke ovens are given in Appendix II. The tests in Appendix II*a* were supervised by H. C. Exell and those in Appendix II*b* by R. P. Donnelly.

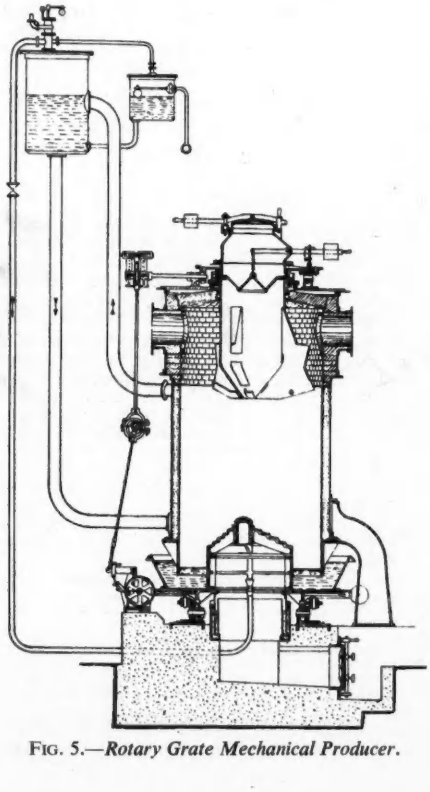

FIG. 5.—*Rotary Grate Mechanical Producer.*

The comparative results for two types of producers are shown in Table II. (At the request of J. S. Thorman in discussion at the Meeting, the results of a steam blown step-grate producer are now included.)

TABLE II.—Heat Balance on Producers (per cent. of Heat Input.)

	Step-grate producers. (Water on grate.)	Step-grate producers. (Steam-blown.)	Rotary grate producers.*
Heat of combustion of producer gas (net) ...	67.9	70.5	76.6
Latent heat of water of combustion of producer gas	2.6	3.9	3.9
Sensible heat of hot producer gas	19.5	17.5	9.3
Latent heat of undecomposed steam in producer gas	1.4	2.1	2.8
Heat of combustion of—ashes	3.8	4.8	1.3
Do. dust	—	—	0.5
Heat in surplus steam from annular boilers ...	—	—	3.0
Losses (by difference)	4.8	1.2	2.6
Heat of combustion of fuel (gross)	100.0%		100.0%
Heat of combustion of fuel (gross) plus total heat of added steam		100.0%	

* Very similar results obtained by Hecker (*G.W.F.* (1932), **75**, 329).

The step-grate producer from which the gas is used hot may be credited with an efficiency of 67.9 + 19.5 = 87.4% of heat in the producer fuel. The rotary grate producer from which the gas is used cold may be credited with an efficiency of 76.6%.

II. *The Heat Carried by the Waste Gases and the Effect of Recuperation of Regeneration.*

The sensible heat carried by the waste gases depends mainly upon their volume and temperature. As an example, let us consider the combustion of producer gas of the composition yielded by the step-grate producers to which Appendix II*a* refers. The theoretical air requirement and the volume of combustion products can be calculated as follows:

Producer gas.	Oxygen requirement.	Air requirement (=4.78 times previous column).	Combustion products (vols. per 100 vols. dry producer gas). CO_2	N_2.	H_2O.
	%				
CO_2 5.6	—	—	5.6	—	—
CO 26.6	13.3	63.6	26.6	50.3	—
H_2 7.8	3.9	18.6	—	14.7	7.8
CH_4 0.1	0.2	1.0	0.1	0.8	0.2
N_2 59.9	—	—	—	59.9	—
100.0					
H_2O 4.2		0.8			5.0
Producer Gas 100 volumes		Air 83.2	32.3	125.7	13.0
Moisture 4.2		Moisture 0.8	20.4% CO_2		

Similarly, the effect of using 10%, 50% or 100% excess air can be calculated and the overall results for these examples are summarized in Table IIa.

TABLE IIa.—Air Requirements and Combustion Products when Producer Gas is Burnt with 0%, 10%, 50% and 100% Excess Air (Vols. per 100 Vols. Dry Producer Gas).

Excess air (%).	Air used (dry) (vols.).	Moisture in air (vols.).	Combustion products (vols.) CO_2.	O_2.	N_2.	H_2O.	Waste gas analysis. CO_2 (%).	O_2 (%).
Nil	83.2	0.8	32.3	*Nil*	125.7	13.0	20.4	*Nil*
10	91.5	0.9	32.3	1.7	132.4	13.1	19.4	1.0
50	124.8	1.2	32.3	8.7	158.6	13.4	16.2	4.3
100	166.4	1.6	32.3	17.4	191.5	13.8	13.4	7.2

The products of combustion of producer gas per 12 lb. of carbon gasified are, therefore:

	lb.—molecules. CO_2.	N_2.	O_2.	H_2O.
With no excess air	1.0	3.89	*Nil*	0.40
With 10% excess air	1.0	4.10	0.05	0.41
With 50% excess air	1.0	4.91	0.27	0.41
With 100% excess air... ...	1.0	5.93	0.54	0.41

Table III shows the sensible heat contents of these four quantities of gases, all of which relate to the gasification of 12 lb. carbon and in this example to 14.2 lb. of dry coke fed to the producers. The heating value of 14.2 lb. of coke and the producer gas from it are as follows:

Heating value of 14.2 lb. of coke = 1.86 therms (*X*).
Heating value of producer gas (net) = 1.263 therms
Sensible heat in producer gas at 830°C. = 0.364 therms } (*Y*)

TABLE III.—Sensible Heat in Combustion Products of Producer Gas, above 15°C. (Therms per 12 lb. of Carbon) (*Z*).

Temperature (°C.).	Excess air *Nil* (therms).	Excess air 10% (therms).	Excess air 50% (therms).	Excess air 100% (therms).
15	*Nil*	*Nil*	*Nil*	*Nil*
100	0.060	0.063	0.074	0.088
200	0.134	0.140	0.164	0.194
300	0.209	0.219	0.256	0.303
400	0.287	0.300	0.351	0.415
500	0.367	0.384	0.449	0.530
600	0.448	0.469	0.548	0.647
700	0.532	0.556	0.650	0.767
800	0.618	0.646	0.756	0.890
900	0.705	0.737	0.861	1.015
1,000	0.794	0.830	0.969	1.143
1,100	0.884	0.925	1.079	1.271
1,200	0.974	1.019	1.189	1.401

To illustrate the application of the data in Table III let us consider an installation of continuous vertical retorts in which there is no recuperation of heat from the waste gases. If the gases leave the setting at 1,000°C. then, according to the proportion of secondary air used, the waste gases (per 12 lb. of carbon) will contain 0.794, 0.830, 0.969, or 1.143 therms of sensible heat. These quantities represent 48.8, 51.0, 59.6, or 70.3% of the sensible heat of the producer gas plus its heat of combustion with cold secondary air. Complementarily, therefore, the heat applied to the setting amounts to 51.2, 49.0, 40.4, or 29.7% of the heat input. To perform the same amount of work in the setting the respective proportions of fuel to be supplied would be 100, 104.5, 126.7, or 172.3 according to the amount of excess air used. Thus it is most important that the proportion of secondary air should be accurately regulated, particularly in settings without recuperation from the waste gases. The various data given above are summarized in Table IV.

TABLE IV.—The Effect of Excess Secondary Air upon the Fuel Requirements of a Non-Recuperative Setting.

Excess secondary air (%).	CO_2 in waste gases (%).	Heat in waste gases at 1,000°C. per 12 lb. of carbon (therms).	(% of heat input to setting).	Heat used in setting (% of heat input to setting).	Relative fuel consumption to perform the same work.
Nil	20.4	0.794	48.8	51.2	100
10	19.4	0.830	51.0	49.0	104.5
50	16.2	0.969	59.6	40.4	126.7
100	13.4	1.143	70.3	29.7	172.3

N.B.—Analyses and temperatures relate to gases immediately prior to leaving settings—*i.e.*, before infiltration of any air into waste gas flues.

Heat Recuperation from the Waste Gases.

The function of a recuperator is to cool the waste gases and to return the heat so recovered to the combustion chamber. Let us consider an example typical of a setting of intermittent vertical retorts fed with hot producer gas and provided with a recuperator for cooling the waste gases by pre-heating the secondary air. Table V gives the quantities of gases involved per 12 lb. of carbon gasified—*i.e.*, per 14.2 lb. of coke charged to the producers—and the heat contents of the secondary air and combustion products at various temperatures.

TABLE V.—Quantities of Gases (lb. Molecules) per 12 lb. of Carbon Gasified and Burnt with 10% Excess Air and Heat Capacities of Secondary Air and Waste Gas at Various Temperatures (Therms).

		CO_2.	N_2.	O_2.	H_2O.
3.10 producer gas 0.13 moisture	2.83 secondary air + 0.03 moisture (10% excess air)	= 1.0	+ 4.1	+ 0.05	+ 0.41

Sensible heat of producer gas at 830°C. = 0.364 therms.	Sensible heat in secondary air preheated to various temperatures. °C.	therms.	Sensible heat in waste gas at various temperatures. °C.	therms.
Net heating value of producer gas 1.263 therms.	15	0	15	0
	100	0.030	100	0.063
	200	0.067	200	0.140
Total 1.627 therms	300	0.103	300	0.219
	400	0.141	400	0.300
	500	0.180	500	0.384
	600	0.219	600	0.469
	700	0.259	700	0.556
	800	0.300	800	0.646
	900	0.342	900	0.737
	1,000	0.384	1,000	0.830

It is important to note that mainly because of its smaller volume, the secondary air has only about half the heat capacity of the waste gases for an equal temperature. This means that with a perfect recuperator of infinite size it is only possible to cool the waste gases from, say, 900°C. to about 500°C. by pre-heating the secondary air to 900°C. In practice, recuperators may be of such a size that the air is pre-heated to about 700°C. by waste gases initially at 900°C.

Fig. 6 shows that pre-heating the secondary air to 700°C. reduces the waste gas loss by 0.26 therms and increases the heat usefully applied to (1.627 minus 0.48) = 1.147 therms. The overall heating

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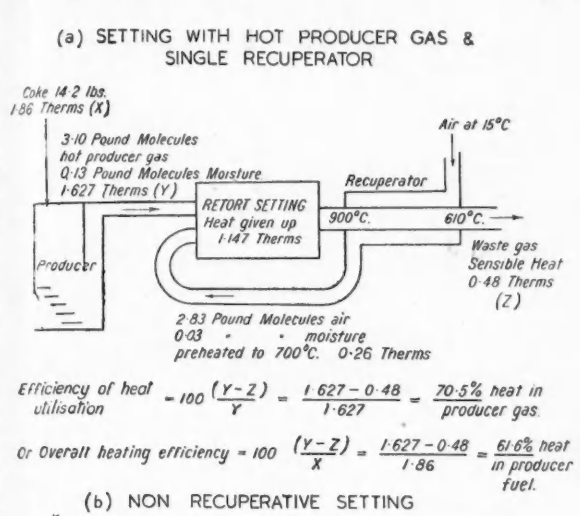

(a) SETTING WITH HOT PRODUCER GAS & SINGLE RECUPERATOR
Coke 14·2 lbs.
1·86 Therms (X)
3·10 Pound Molecules
hot producer gas
0·13 Pound Molecules Moisture
1·627 Therms (Y)
Air at 15°C
Recuperator
RETORT SETTING
Heat given up
1·147 Therms
900°C.
610°C.
Waste gas
Sensible Heat
0·48 Therms
(Z)
Producer
2·83 Pound Molecules air
0·03 " " moisture
preheated to 700°C. 0·26 Therms
Efficiency of heat utilisation = 100 (Y−Z)/Y = 1·627 − 0·48 / 1·627 = 70·5% heat in producer gas
Or Overall heating efficiency = 100 (Y−Z)/X = 1·627 − 0·48 / 1·86 = 61·6% heat in producer fuel.
(b) NON RECUPERATIVE SETTING
(Quantities adjusted to give the same liberation of heat in the retort setting)
Coke 18·3 lbs.
2·40 therms
(X)
4·0 Pound Molecules
hot producer gas
0·17 Pound Molecules Moisture
2·097 therms (Y)
RETORT SETTING
Heat given up
1·147 therms
900°C
Waste Gas
Sensible Heat
0·95 therms (Z)
Producer
Air at 15°C.
Efficiency of heat utilisation = 100 (Y−Z)/Y = 2·097 − 0·95 / 2·097 = 54·7% heat in producer gas
Or Overall heating efficiency = 100 (Y−Z)/X = 2·097 − 0·95 / 2·40 = 47·8% heat in producer fuel.

FIG. 6.

efficiency as a proportion of the heat supplied in the producer gas is thus 70.5%. In contrast to this fig. 6 also shows that a completely non-recuperative setting requires 29% more producer gas for the same useful application of heat within the combustion flues. This is borne out in practice where the elimination of recuperators from installations of horizontal and intermittent vertical retorts has increased the fuel consumption from about 3 cwt. to 4 cwt. per ton of coal.

One further observation regarding fig. 6 is that *the pre-heat of* 0.26 *therms in the secondary air is as effective as the supply of an additional* 0.47 *therms of producer gas to a non-recuperative setting*. The reason is that the pre-heat in the secondary air does not involve any increase in volume of waste gases and, therefore, is applied to the retort setting without a corresponding flue loss. In the non-recuperative setting

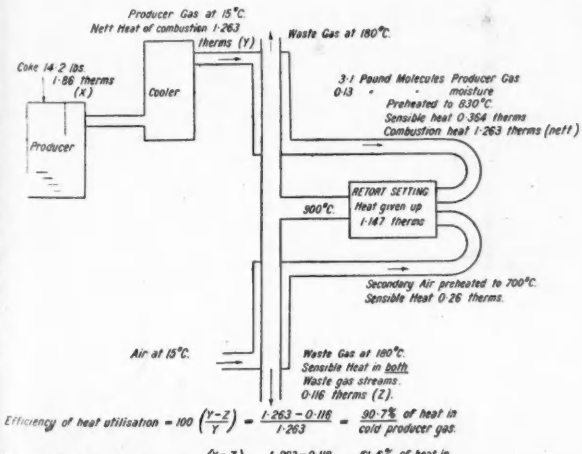

Producer Gas at 15°C.
Nett Heat of combustion 1·263
therms (Y)
Waste Gas at 180°C.
Coke 14·2 lbs.
1·86 therms
(X)
Cooler
3·1 Pound Molecules Producer Gas
0·13 " " moisture
Preheated to 830°C.
Sensible heat 0·364 therms
Combustion heat 1·263 therms (nett)
Producer
RETORT SETTING
Heat given up
1·147 therms
900°C.
Secondary Air preheated to 700°C.
Sensible Heat 0·26 therms.
Air at 15°C.
Waste Gas at 180°C.
Sensible Heat in both
Waste gas streams.
0·116 therms (Z).
Efficiency of heat utilisation = 100 (Y−Z)/Y = 1·263 − 0·116 / 1·263 = 90·7% of heat in cold producer gas.
Or Overall heating efficiency = 100 (Y−Z)/X = 1·263 − 0·116 / 1·86 = 61·6% of heat in producer fuel.

FIG. 7.—*Setting with Cold Producer Gas or Double Recuperator.*

45% of the extra 0.47 therms to be supplied is carried away by the extra volume of waste gases, and only 0.26 therms are usefully applied. (This important aspect of recuperation or regeneration is discussed by H. M. Spiers—*Technical Data on Fuel*, 4th edn., 1935, pp. 322 and 323).

Preheating both Secondary Air and Producer Gas.

It is a very common fallacy to assume that regenerators—*i.e.*, chequered chambers through which the waste gases and secondary air alternately flow—are more efficient than recuperators. This fallacy exists because in coke oven plants the waste gases leave the regenerators at about 300°C. compared with 600°C., as already mentioned for the recuperators of retort settings. The difference lies in the fact that in coke oven plants *both* secondary air and cold producer gas are available for cooling the waste gases, and their total volume and heat capacity are substantially the same as for the waste gases.

If in the recuperative setting illustrated in fig. 6 the producer gas had been cooled and afterwards preheated in an additional recuperator so as to recover the 0.364 therms lost in cooling, then the fuel consumption would have remained unchanged. The efficiency of the producer would have been reduced from 87.4% to 67.9%, but the efficiency of utilization increased from 70.5% to 90.7%, the overall efficiency remaining at 61.6% of the heat in the producer fuel.

Fig. 7 illustrates the use of cold producer gas and double recuperation for the same useful application of heat as in fig. 6.

III. *The Heat Carried away by the Products of Carbonization.*

(a) *The Crude Coal Gas.*

For retorts in which the coal charge is static and the end temperature of the coke is about 1,000°C.—*e.g.*, horizontal retorts, intermittent vertical retorts and coke ovens—the crude gas leaves the retort at about 600°C. If the hot gas is sprayed with liquor almost immediately after leaving the retorts, as in many installations, the gas is adiabatically cooled to about 77° to 80°C. (170° to 176°F.) by the evaporation of water into the gas. Fig. 8 shows a chart* of temperatures before and after the liquor sprays in the gas off-take of an intermittent vertical retort. The temperatures were measured at the positions indicated in fig. 9. The cooling of 100 cu.ft. of gas plus 25 cu.ft. of water vapour from 600°C. to 80°C. involves a loss of approximately $1.25 \times 2.03 \times (600-80) \times 1.8 = 2{,}340$ B.Th.U. The transference of this quantity of sensible heat into latent heat involves the evaporation of about 2.3 lb. of water per 100 cu.ft. of gas—*i.e.*, upwards of 30 gallons per ton of coal carbonized. This is an important fact which should not be lost sight of in the design of liquor circulating systems and their relationship to the condensing system. A very reliable method of estimating the heat in the crude gas leaving the retorts is obtained in those cases where the gas is sprayed in the off-takes, by computing the heat content of the gas from temperature and humidity observations at the retort house governor. At this point the gas is usually saturated, and Appendix 3 gives the total heat content of saturated gas at various temperatures and pressures in conventional units.

For coke ovens and intermittent vertical retorts the gas leaves the installation saturated with water vapour and at a very steady temperature of 77° to 80°C. (170° to 176°F.), and carries about 4,000 to 5,000 B.Th.U. per 100 cu.ft. of purified gas. A similar figure is equally applicable to horizontal retorts fitted with Congdon pipes. In the case of horizontal retorts with ascension pipes much heat is lost before the gas meets liquor and in consequence the gas leaves the installation at a lower temperature.

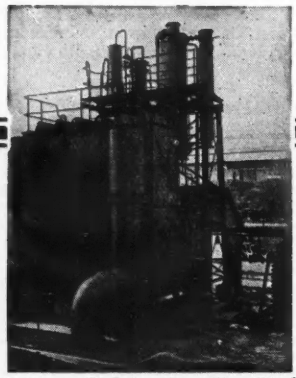
The temperature of the crude gas leaving continuous vertical retorts varies with the type of coal, and its size grading as affecting the degree of heat exchange between the outgoing gases and the incoming coal. With strongly swelling run-of-mine Durham coal temperatures of 250–300°C. are normal. Screened coals and less strongly swelling coals yield lower gas off-take temperatures. As in the previous examples, if the retort off-takes are sprayed with liquor, the best guide of the heat lost in the crude gas is obtained from the heat content of the crude gas at the retort house governor. In the case of run-of-mine Durham coals steamed to yield gas with a calorific value in the range of 500–540 B.Th.U. per cu.ft. the gas leaves a continuous vertical retort installation at about 70°C. (160°F.), and carries about 2,800 B.Th.U. per 100 cu.ft. of purified gas.

In the case of steamed vertical retorts, however, it is necessary to remember that the crude coal gas leaving the retorts contains the undecomposed part of the steam added to the base of the retorts. An estimate of the undecomposed steam must be made and its latent heat deducted from the total heat of the crude coal gas.

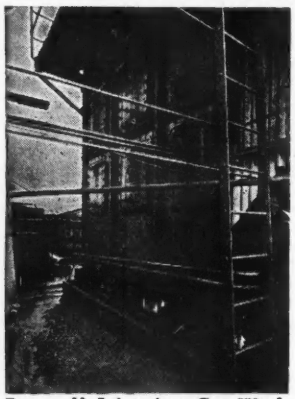
* Kindly supplied by E. R. Randall, of Southall.

(*To be continued*)

At a Meeting of the Dundee Corporation Finance Committee approval was given to a proposal for the joint reading of gas and electricity meters, as also for the joint issue of accounts, for an experimental period of one year.



"Permac" Joints in a Gas Works.



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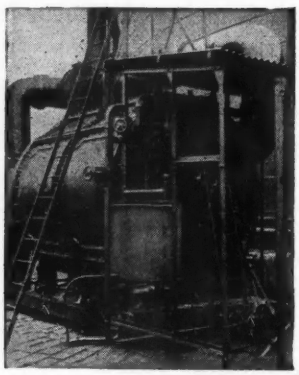

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Gas Products Prices

The London Market Jan. 11.

The chief item of interest in connection with the Coal Tar Products market is the issue of a new Government Order, the Coal Tar Products Prices Order, 1942 (S. R. & O., 1942, No. 2509), which came into force on January 1, 1943.

All Coal Tar Products are in good demand, and Pitch in the London area remains about 45s.

The Provinces Jan. 11.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 10d., pure, 2s. 5d. (controlled by the Control of Toluene No. 2 Order, July 3, 1941, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 1s. to 1s. 4d. according to quality. Solvent naphtha, naked, North, 2s. 2d. to 2s. 6d. Heavy naphtha, North, 1s. 10d. to 1s. 11d. Carbolic acid, 60's, controlled by the Coal Tar Acids Prices (Inland) Order, 1942, operative from May 1. Naphthalene, controlled by the Naphthalene prices (Inland) Order, 1942, dated April 15, 1942, and operative from May 1, 1942, £19 to £19 10s.—bags free. Anthracene, controlled by the Anthracene Prices (Inland) Order, 1942, operative from May 1. Filtered heavy oil (min. gr. 1,080), 7¼d. to 8d. Creosote oil has been generally controlled as to direction and price for some time past. Current value—fuel grades 5d. to 5¼d; timber preservation and other purposes 4¾d. to 6d. These prices apply as from May 13.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

Tar Products in Scotland Jan. 9.

Deliveries are proceeding rapidly. Refined tar controlled. Value is 4½d. per gallon *ex* Works, naked. Creosote oil: Specification oil, 6½d. to 7d.; low gravity, 7¼d. to 7½d.; neutral oil, 6¾d. to 7d. per gallon; all *ex* Works in bulk. Refined cresylic acid is fairly active at 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha: 6½d. to 7d. per gallon. Solvent naphtha: Basic prices delivered in 1,000 gallon lots, 90/160 grade 2s. 8d., and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 3d. per gallon. Pyridine: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

Gas Stocks and Shares

The good news from Russia during the week gave a fillip to business in several sections, notably among home rails and industrials, and advances in prices were widely spread. Activity in gas stocks and shares was also on a larger scale and, with two exceptions, all price movements were in an upward direction. Gas Light units went ahead again, closing 9d. higher at 17s. 3d., and Commercial made a further jump of 4 points to 64½, changing hands up to 66. The United Kingdom Gas Corporation ordinary shares were also a good feature with a rise of 9d.

At the time of writing, several small parcels of debenture stock are available all of which give a yield of 4%—*viz.*, £500 British Gas Light "Norwich" 3% redeemable at 75; £150 East Surrey 5% at 125; £100 Farnham 4% at 100; and £350 Farnham 5% at 125; while Ryde 4% 99 gives £4 0s. 10d.

The following price changes occurred during the week:

OFFICIAL LIST

Commercial Ord.	62—67	+4
Croydon max. Div.	87—92	+1
Gas Light Units	16/9—17/9	+-/9d.
Ditto 3 p.c. Deb.	82—87	+3
Imperial Continental	77—82	-1
Mid-Southern 4 p.c. Pref.	82—87	+3
Primitiva Holdings Ord.	10/6—12/6	+-/6d.
South Metropolitan 3 p.c. Deb. ...	77—82	+2
Ditto 5 p.c. Red. Deb.	102—107	+2
United Kingdom Gas Corporation Ord.	19/—20/-	+-/9d.
Ditto 4½ p.c. 2nd Pref.	14/6—16/6	+-/6d.

SUPPLEMENTARY LIST

Tottenham 5 p.c. Reg. Red. Mortgages (*x.d.*)	99—102	Jan. 4

PROVINCIAL EXCHANGES

Newcastle 3½ p.c. Deb. (*x.d.*) ...	93½—94½	Dec. 28
Ditto 3½ p.c. Red. Deb. (*x.d.*) ...	92—93	,,

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